61 AF/IFW

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Akinori KOUKITU et al.

Group Art Unit: 1792

Application No.: 10/509,177

Examiner: M. SONG

Filed: September 27, 2004

Docket No.: 121213

For: VAPOR PHASE GROWTH METHOD FOR A1-CONTAINING III-V GROUP COMPOUND SEMICONDUCTOR, AND METHOD AND DEVICE FOR PRODUCING A1-CONTAINING III-V GROUP COMPOUND SEMICONDUCTOR

SUBMISSION OF RULE 132 DECLARATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

As a supplement to the Amendment (filed with Rule 132 Declaration) filed on May 11, 2009, attached is a copy of the Rule 132 Declaration as filed, including color photographs.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Andrew B. Whitehead
Registration No. 61,989

JAO:ABW/hs

Date: May 11, 2009

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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Akinori KOUKITU et al. Group Art Unit: 1792

Application No.: 10/509,177 Examiner: M. SONG

Filed: September 27, 2004 Docket No.: 121213

For: VAPOR PHASE GROWTH METHOD FOR Al-CONTAINING III-V GROUP COMPOUND SEMICONDUCTOR, AND METHOD AND DEVICE FOR PRODUCING Al-CONTAINING III-V GROUP COMPOUND SEMICONDUCTOR

DECLARATION UNDER 37 C.F.R. §1.132

I, Koukitu Akinori, a citizen of Japan, hereby declare and state:

1. I have a degree in Semiconductor Electronics which was conferred upon me by Tohoku University in Miyagi Japan in 1981.

2. I have been employed by Tokyo University of Agriculture and Technology since 1977 and I have had a total of 34 years of work and research experience in Semiconductor Electronics.

4. I am a named inventor in the above-captioned patent application and I am familiar with the application.

5. I and/or those under my direct supervision and control have conducted the following tests:

EXAMPLE:

(1) Reacted Al with a halogenated hydrogen HCl at a temperature of 650°C for five hours. The 650°C temperature is the maximum temperature in the claims for the first step in the first reaction zone. This reaction was performed two times. Fig. 1A and 1B show the

quartz reaction tube remains clear after the experiment, thus indicating a lack of contamination. See Appendix A, Figs. 1A and Appendix B, Fig. 1B. These are only the First Step Zone.

COMPARATIVE EXAMPLES:

(2) Reacted Al with a halogenated hydrogen HCl at a temperature of 660°C for five hours. This experiment was performed two times. Figs. 2A and 2B show the quartz reaction tube after conducting the experiment at 660°C. As shown in Figs. 2A and 2B, the quartz reaction tube has a charcoal colored stain, thus indicating contamination of the reaction tube. See Appendix A, Figs. 2A and Appendix B, Fig. 2B. These are only the Fist Step Zone.

(3) Reacted Al with a halogenated hydrogen HCl at a temperature of 680°C for five hours. This experiment was performed two times. Figs. 3A and 3B show the quartz reaction tube after conducting the experiment at 680°C. As shown in Figs. 3A and 3B, the quartz reaction tube has a greater amount of charcoal colored staining than that of the quartz tube of comparative example (2), thus indicating increased contamination of the reaction tube. See Appendix A, Fig. 3A and Appendix B, Fig. 3B.

(4) Reacting Al with a halogenated hydrogen HCl at a temperature of 700°C for three hours. This experiment was performed two times. Figs. 4A and 4B show the quartz reaction tube after conducting the experiment at 700°C. As shown in Figs. 4A and 4B, the quartz reaction tube has a greater amount of charcoal colored staining that than of the quartz tube of comparative examples (2) and (3), thus indicating increased contamination of the reaction tube. See Appendix A, Fig. 4A and Appendix B, Fig. 4B.

(5) Reacting Al with a halogenated hydrogen HCl at a temperature of 720°C for three hours. Fig. 5A shows the quartz reaction tube after conducting the experiment at 720°C. As shown in Fig. 5A, the quartz reaction tube has a great amount of charcoal colored staining

than that of the quartz tube of comparative examples (2)-(4) thus indicating increased contamination of the reaction tube. See Appendix A, Fig. 5A.

(6) Reacting Al with a halogenated hydrogen HCl at a temperature of 780°C for one hour. Fig. 6A shows the quartz reaction tube after conducting the experiment at 780°C. As shown in Fig. 6A, the quartz reaction tube has a greater amount of charcoal colored staining than that of the quartz tube of comparative examples (2)-(5) thus indicating increased contamination of the reaction tube. See Appendix A, Fig. 6A.

(7) Reacting Al with a halogenated hydrogen HCl at a temperature of 850°C for one hour. This experiment was performed two times. Figs. 7A and 7B show the quartz reaction tube after conducting the experiment at 850°C. As shown in Figs. 7A and 7B, the quartz reaction tube has a greater amount of charcoal colored staining than that of the quartz tube of comparative examples (2)-(6), thus indicating increased contamination of the reaction tube. See Appendix A, Fig. 7A and Appendix B, Fig. 7B.

The attached illustrations, Figs. 1A-7A of Appendix A, show the quartz reaction tube after conducting each of the above-mentioned Example (1) and Comparative Examples (2)-(4) and (7), in accordance with the method of the present application (U.S. Patent Application No. 10/509,177).

As illustrated in Figs. 1A and 1B, the quartz tube is completely transparent after conducting the experiment at 650°C (top end of temperature range of claim 1), and thus the quartz tube is not contaminated. However, Figs. 2A-7A and 2B-4B and 7B each illustrate that the quartz tube turns a progressively darker "charcoal color" when the reaction is conducted at temperatures above 650°C (temperatures above those claimed in claim 1), indicating that the quartz reaction tube has become contaminated during the reaction with halogenated hydrogen and Al. As illustrated in the Figs. 2A-7A and 2B-4B and 7B, the amount of contamination increases with a corresponding increase in temperature above 650°C.

Based on the above-described experiments, it is my expert opinion that the critical temperature to maintain in reacting a solid Al with a halogenated hydrogen, to avoid contamination of the quartz reaction tube, is 650°C.

6. If the above Example (1) and Comparative Examples (2)-(7) were performed using a mixture of Group III metals including Al, the same results would occur.

7. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: 1 May, 2009

A. Koukitu

Koukitu Akinori

APPENDIX A

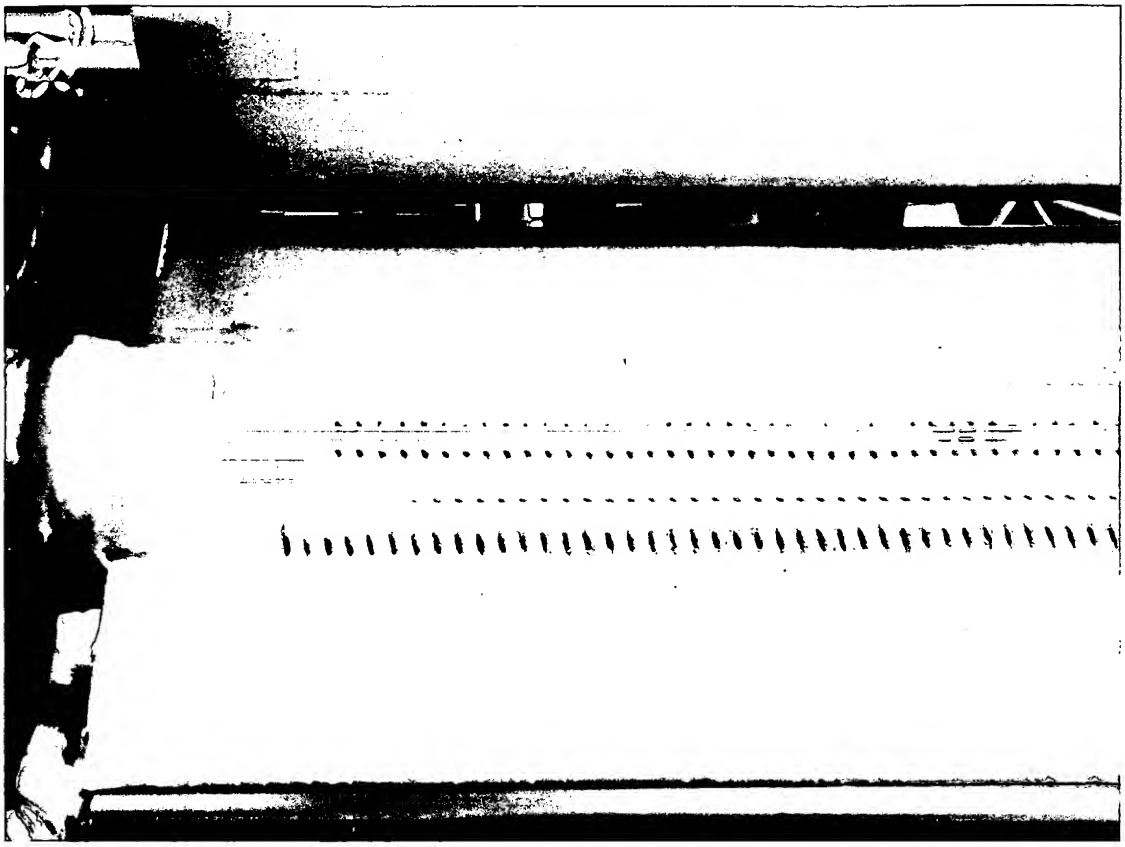

Fig. 1A

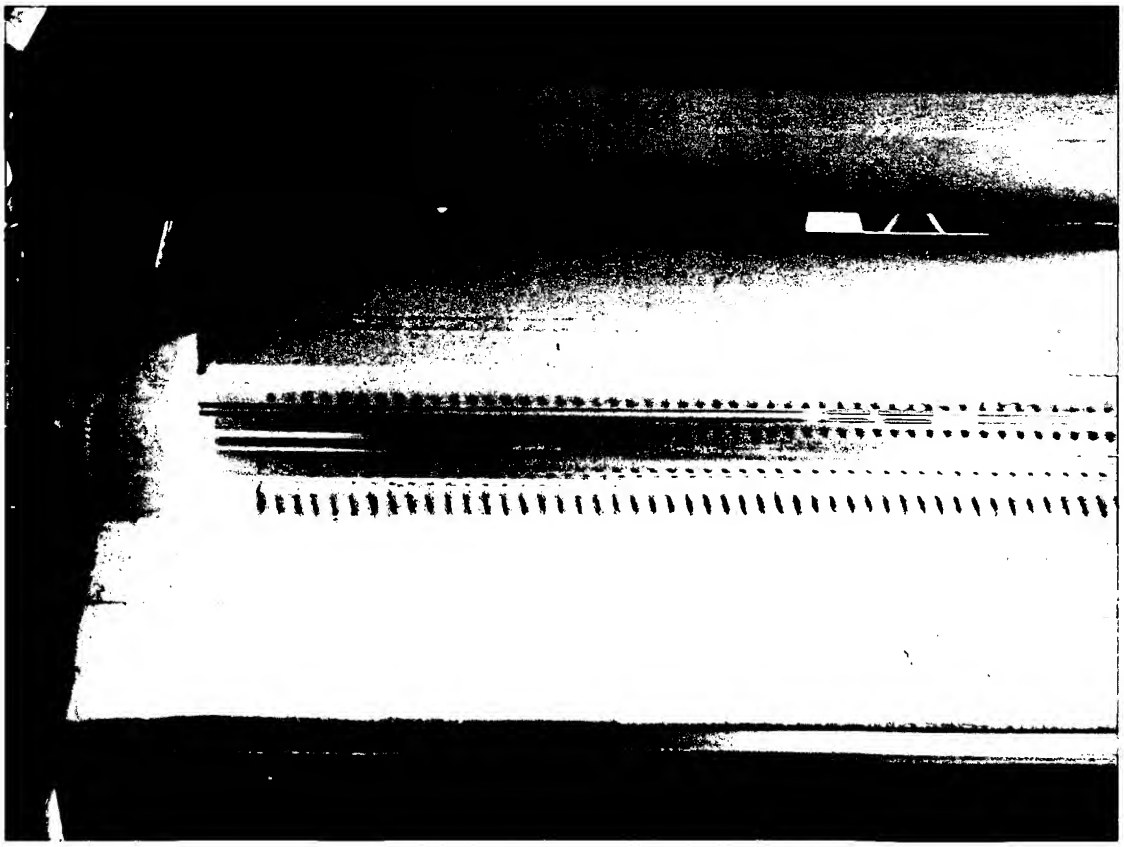

Fig. 2A

APPENDIX A

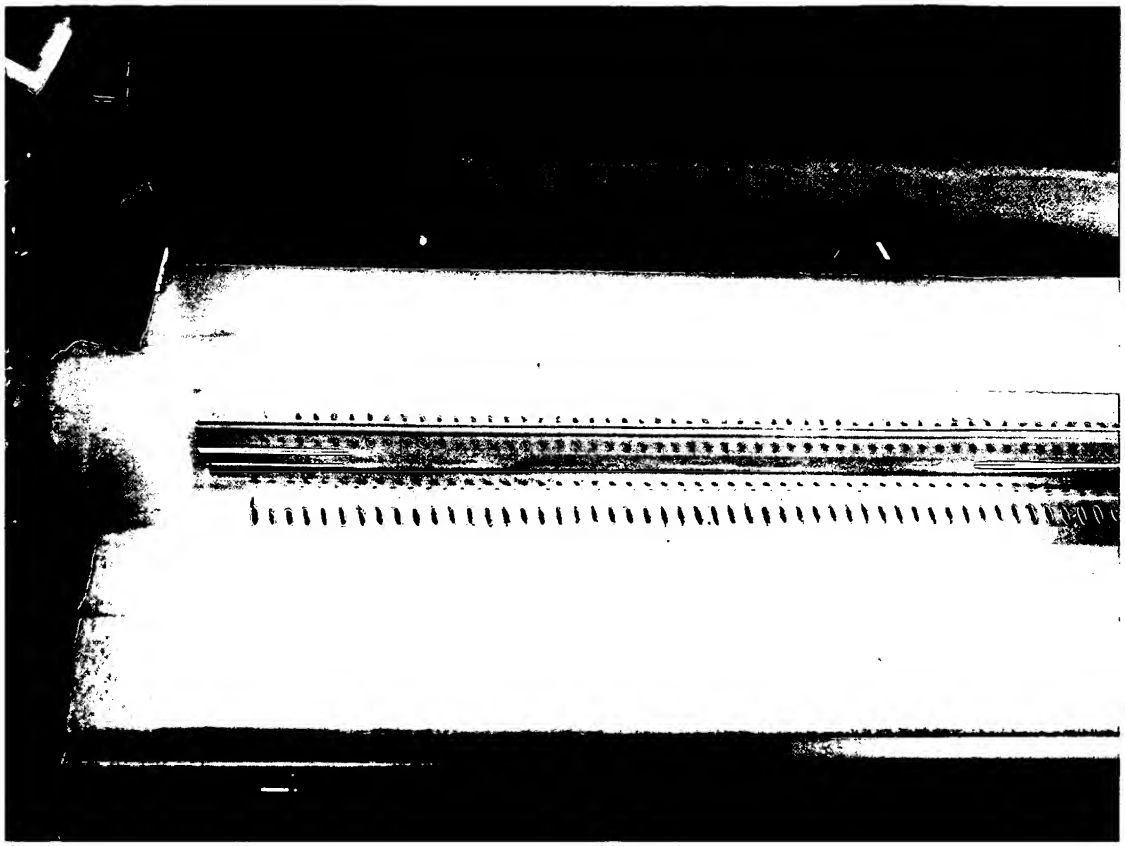

Fig. 3A

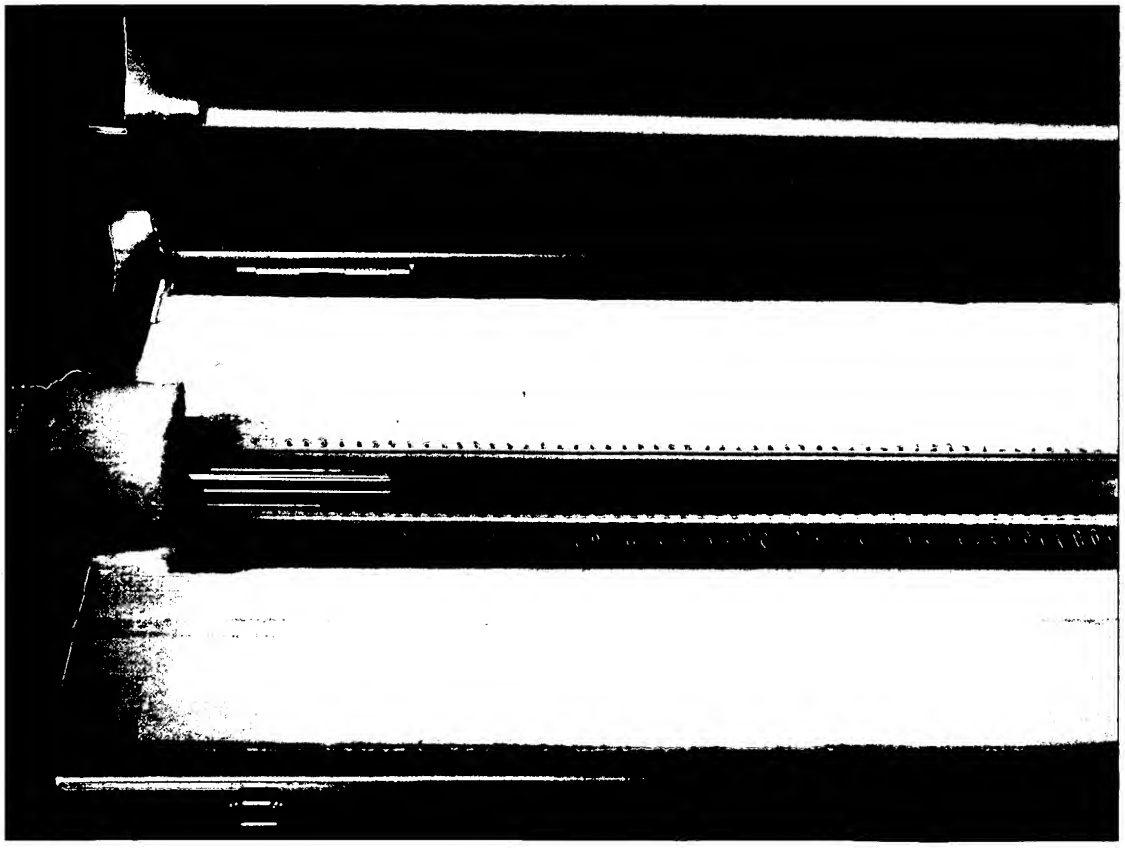

Fig. 4A

APPENDIX A

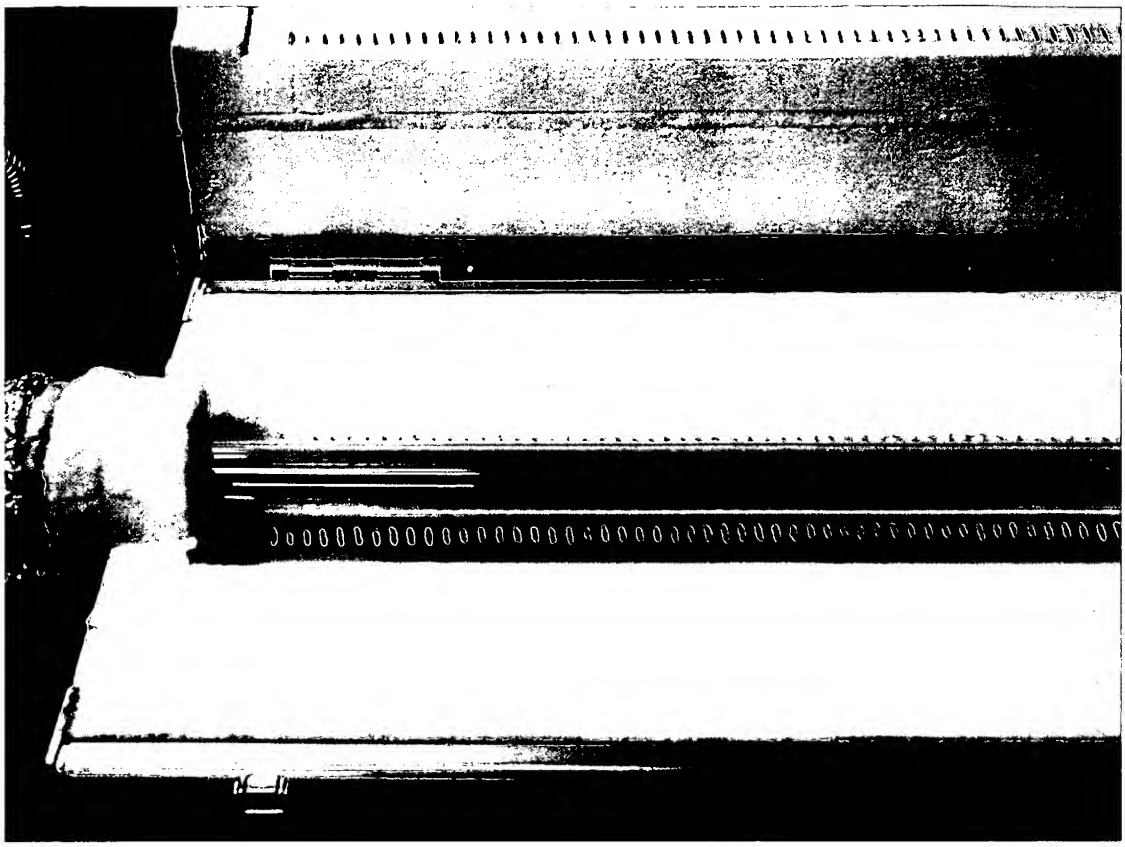

Fig. 5A

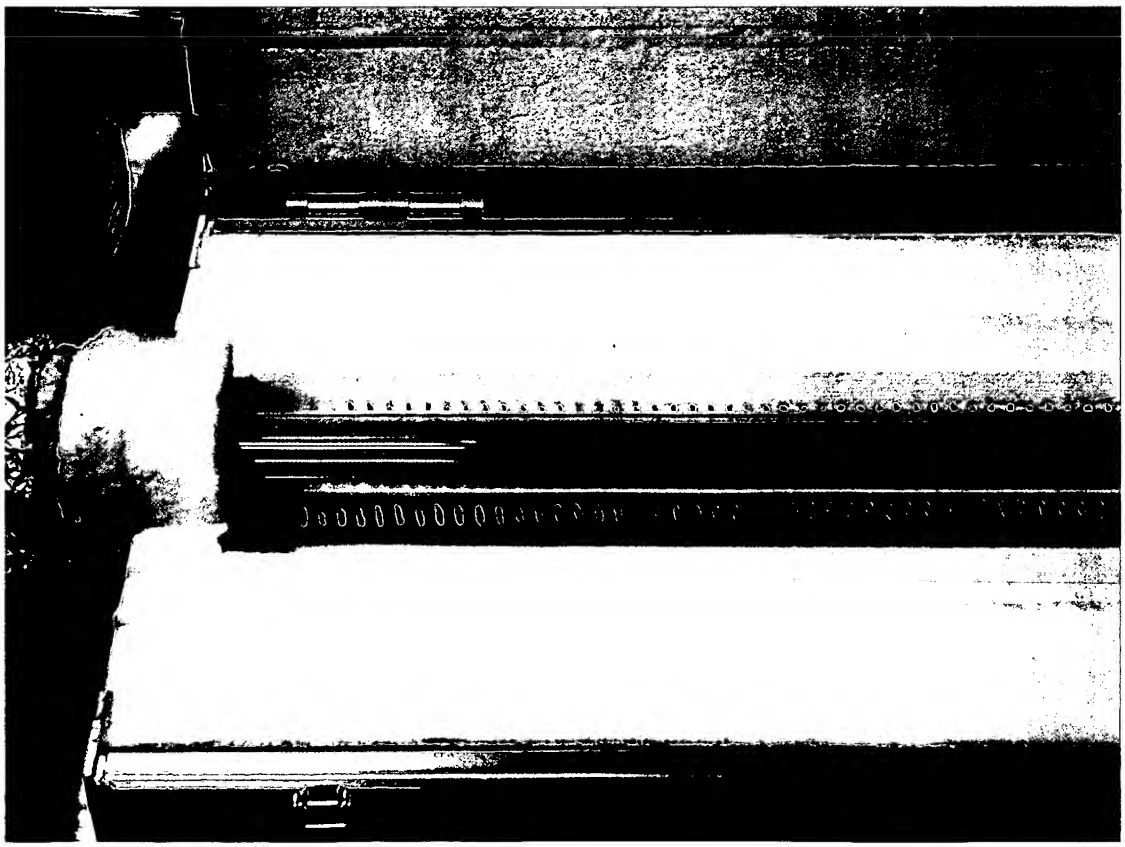

Fig. 6A

APPENDIX A

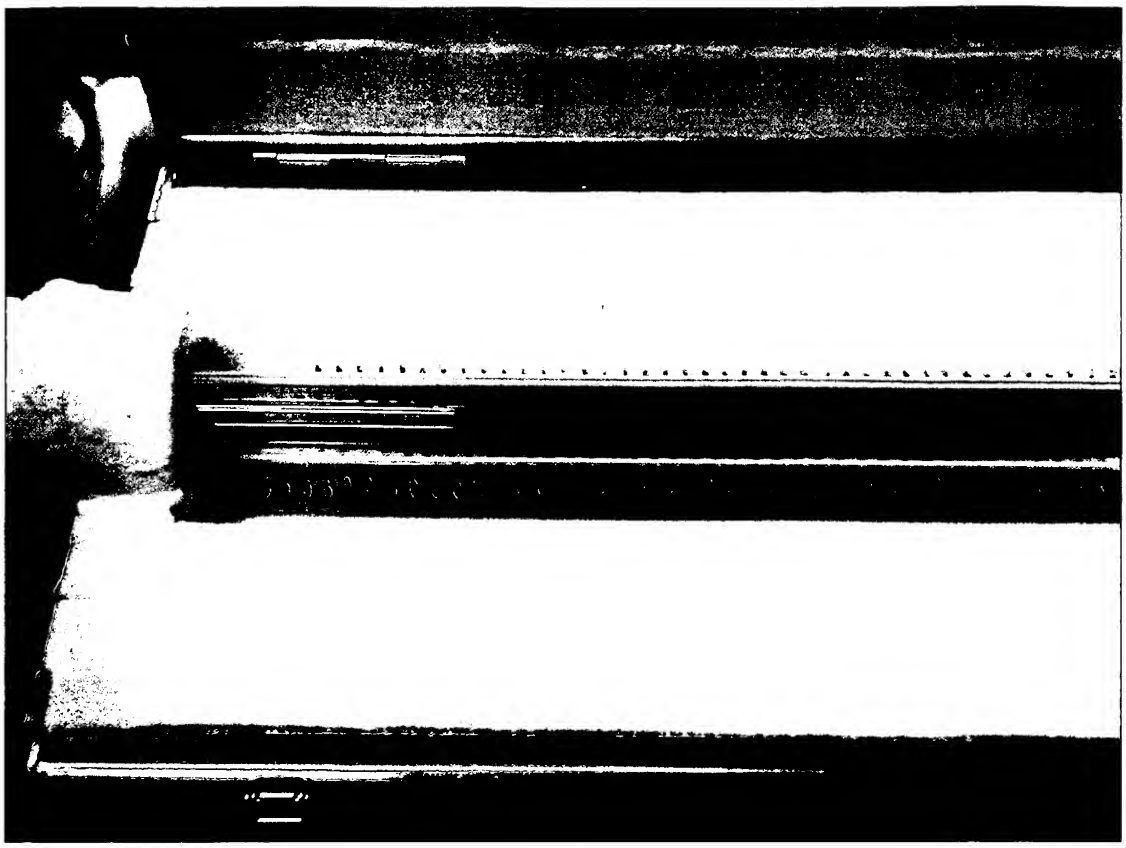

Fig. 7A

APPENDIX B

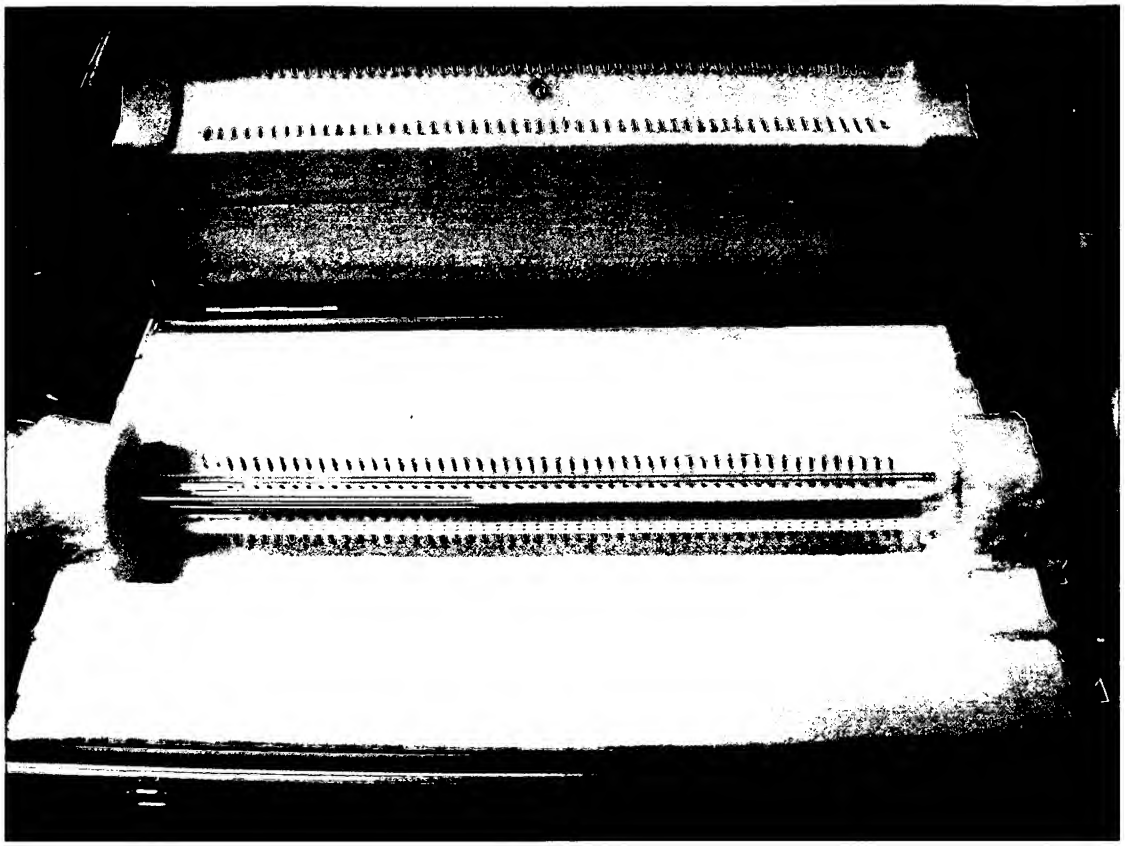

Fig. 1B

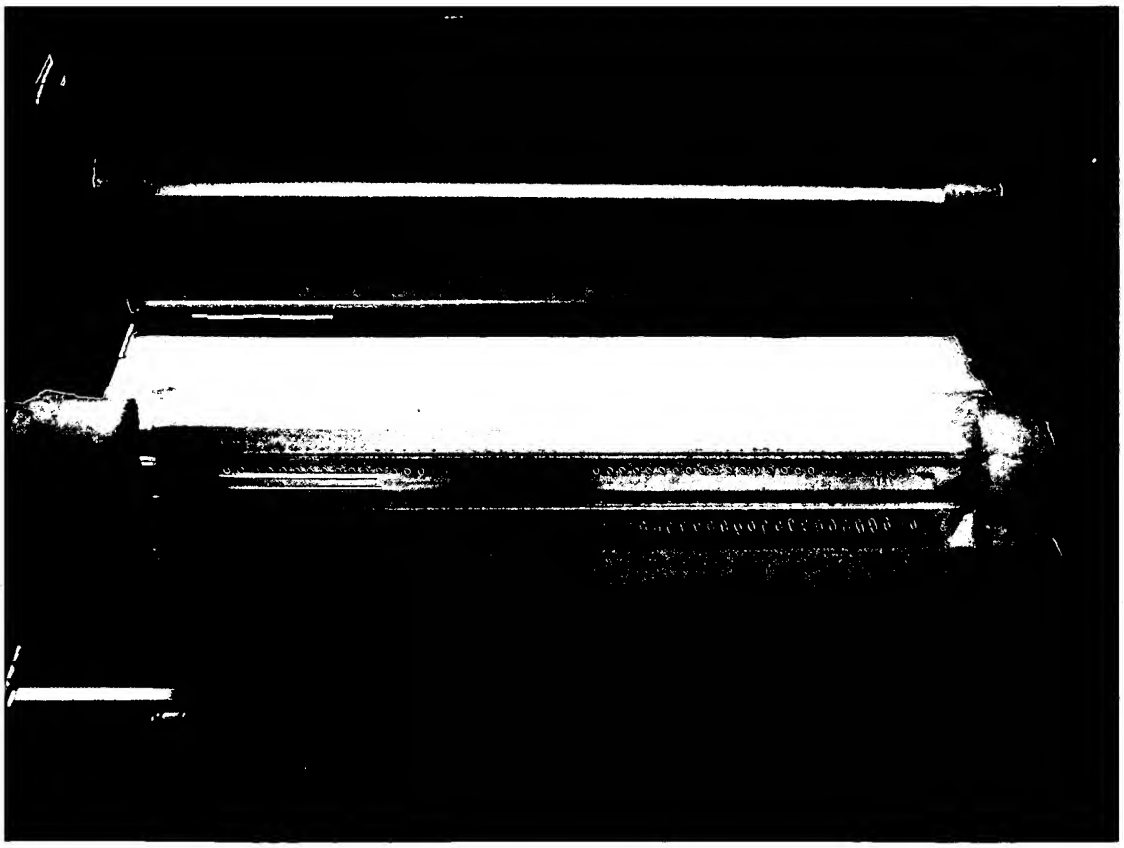

Fig. 2B

APPENDIX B

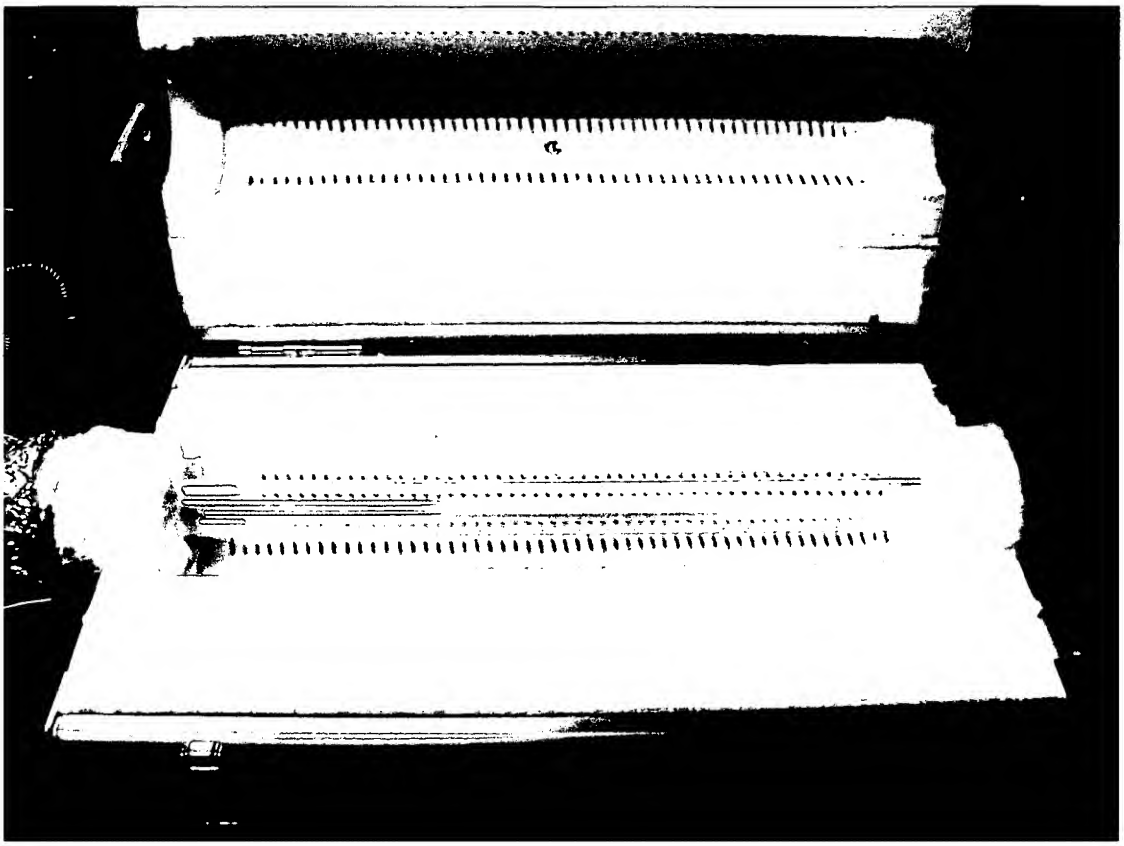

Fig. 3B

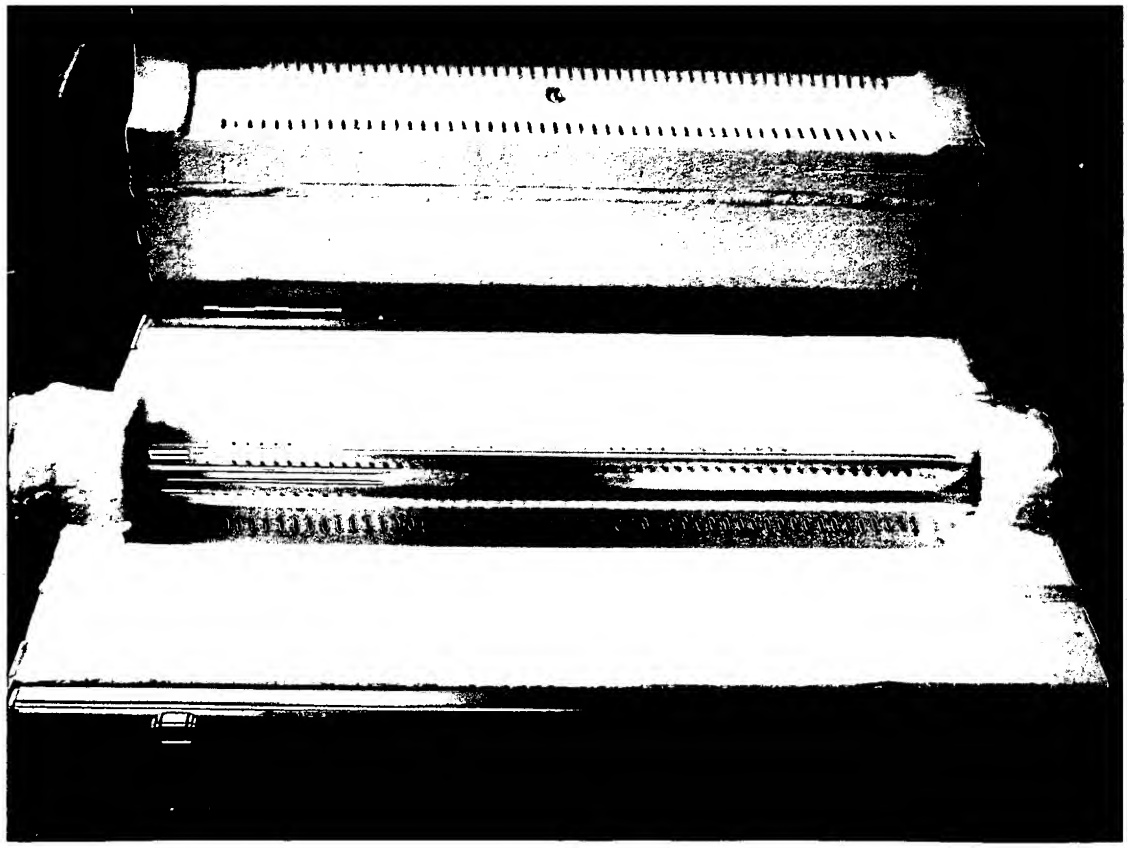

Fig. 4B

APPENDIX B

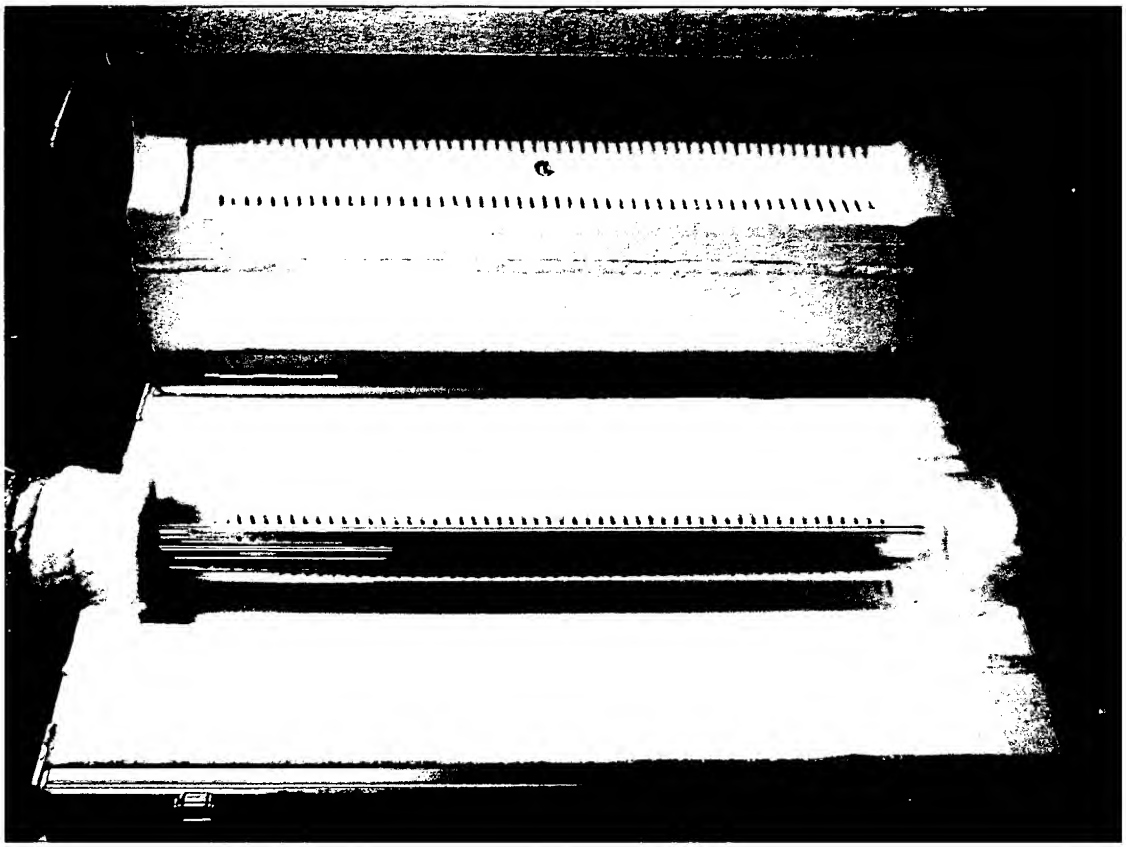

Fig. 7B